

BIOLOGY

Public Release 2008

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Sample A

Which of these instruments should a student use to measure the length of a housefly?

- A microscope
- B metric ruler
- C funnel
- D graduated cylinder

Sample B

Which of these systems directly provides support for the human body?

- F skeletal
- G excretory
- H endocrine
- J reproductive



- 1** The skull of a modern bird, the herring gull, is shown below.



Herring Gull

Which of the vertebrate skulls shown below is probably most closely related to modern birds?

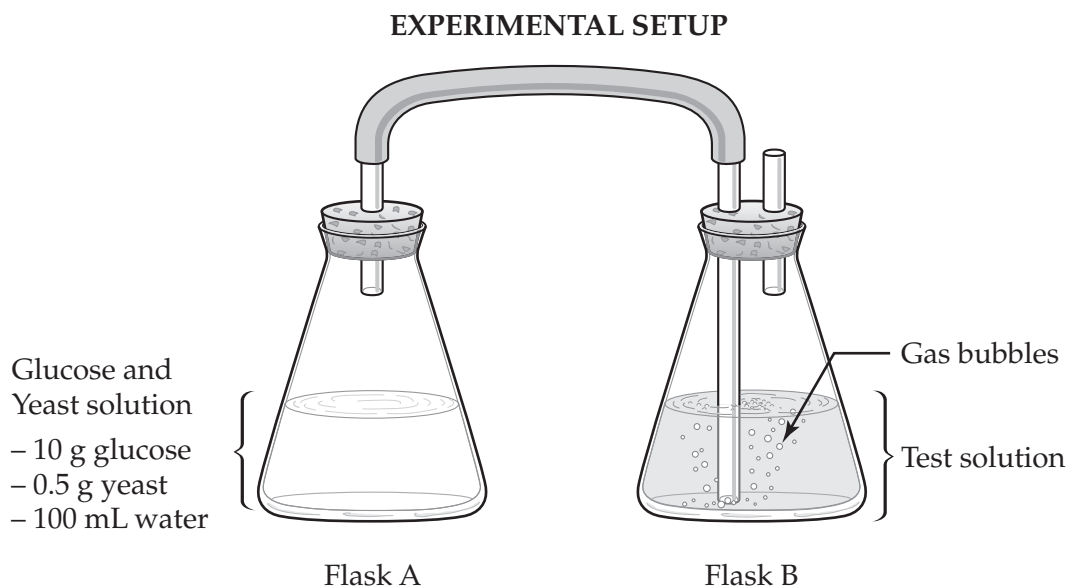


- 2** Fluoride is added to drinking water supplies in many states. People cannot see fluoride in the water because it

- F** turns into water
- G** settles to the bottom of a container
- H** dissolves to form a colorless solution
- J** is less dense than water so it floats

**3**
BCR

A group of students wants to determine whether a gas is released when glucose is added to a solution of living yeast cells and water. Their experimental setup is shown below.



The students add glucose to a mixture of yeast and water in Flask A. If a gas is released, the test solution in Flask B will turn yellow. The students observe and record the appearance of Flask B at the beginning of the experiment, and again after 24 hours.

- Explain the importance of using a control in the experiment.
- Describe a control for this experiment. Be sure to include the specific parts of the setup.
- Compare the control to the original experimental setup.

Write your answer in your Answer Book.

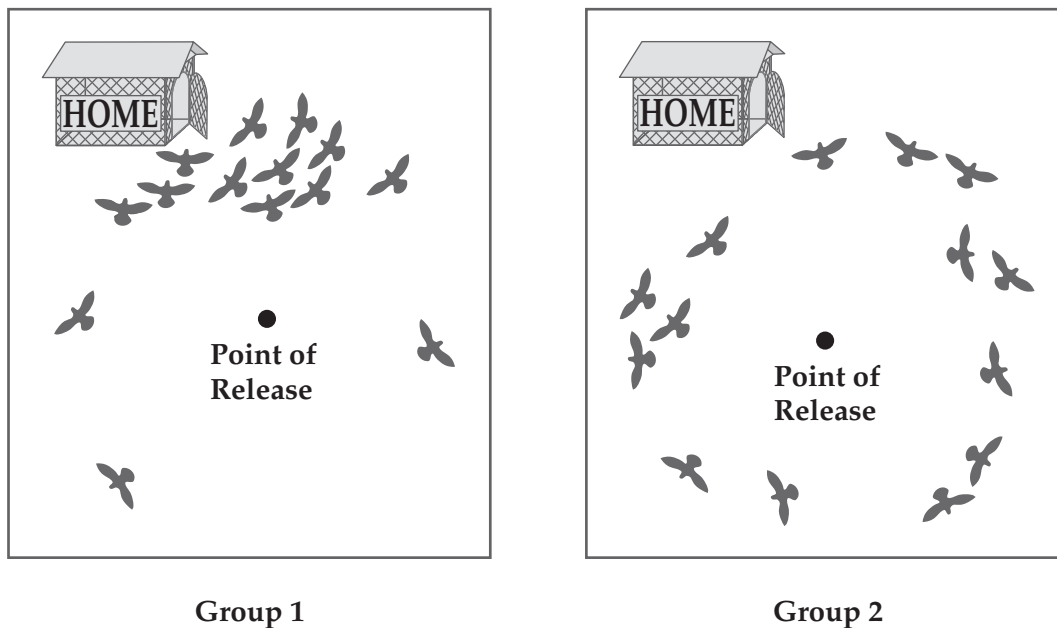


**4**

A scientist hypothesizes that homing pigeons use their sense of smell to find their way home. She tests this idea on two groups of pigeons. She releases the pigeons in Group 1 and records the direction of their flight.

The pigeons in Group 2 are given a substance that blocks their sense of smell for a short time. The scientist then releases them and records the direction of their flight. Her data are shown on the diagram below.

FLIGHT DIRECTIONS OF HOMING PIGEONS



From these results, what can be concluded about the scientist's hypothesis?

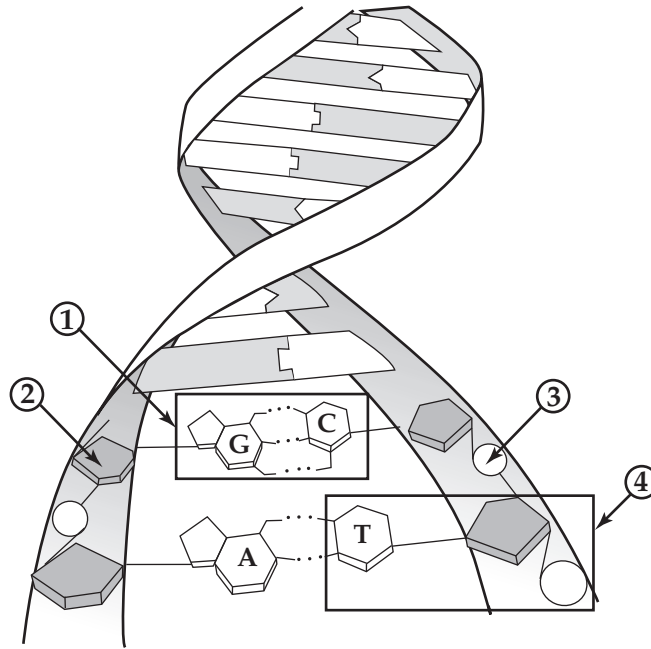
- F** It is supported by the data.
- G** It must be modified and tested again.
- H** It is not supported by the data.
- J** It can be applied to all bird species.





Directions

Use the diagram below to answer Numbers 5 and 6.



5 Which of these is a nucleotide?

- A 1
- B 2
- C 3
- D 4

6 Which of these is a sugar?

- F 1
- G 2
- H 3
- J 4



7 One kind of chromosomal mutation can occur during meiosis when a pair of chromosomes that carry genes for the same trait fail to separate. Which of these represents the sex chromosomes of a male organism when this type of chromosomal mutation has occurred?

- A XXY
- B XX
- C XY
- D XXX

8 The human body functions properly when organ systems work together. Which organ system works with the muscular system to control muscle contraction?

- F circulatory
- G excretory
- H nervous
- J reproductive

9
BCR A pharmaceutical company is selling a new allergy medicine. The company claims their medicine is the fastest-acting and longest-lasting. They also claim that it has the fewest side effects. The company's claims are based on a study conducted with 10 patients chosen at random.

Should consumers believe the claims made by this company? In your response, be sure to

- evaluate the study conducted by the pharmaceutical company
- describe any changes you would make to the study that could strengthen the company's claims
- describe methods to produce more reliable data, and explain how these could strengthen the company's claims

Write your answer in your Answer Book.





- 10** The use of certain chemicals by humans has caused holes to form in the Earth's ozone layer. This allows more ultraviolet (UV) light to reach the oceans. Scientists are concerned that an increase in UV light will start killing microscopic marine algae.

Which of these statements describes how the ocean food web would be affected by a large decrease in microscopic marine algae?

- F There will be fewer marine animals because there will be fewer producers.
- G There will be no change because the algae are very small.
- H There will be more consumers because the UV light kills producers.
- J There will be fewer consumers because the UV light kills decomposers.



Directions

Use the information below to answer Numbers 11 and 12.

An insecticide is a chemical that kills insects. Most insects are killed the first time they are exposed to an insecticide. However, some insects carry a gene that enables them to survive their first exposure to an insecticide. When these surviving insects reproduce, this gene may be inherited by their offspring. The number of insecticide-resistant insects usually increases over time because increasing numbers of offspring with this gene are able to survive and reproduce.

11 Which process enables increasing numbers of insects to survive their initial exposure to an insecticide?

- A cloning
- B mutation
- C natural selection
- D genetic engineering

12 What is the ecological relationship between insects and crops?

- F mutualism
- G competition
- H predation
- J commensalism



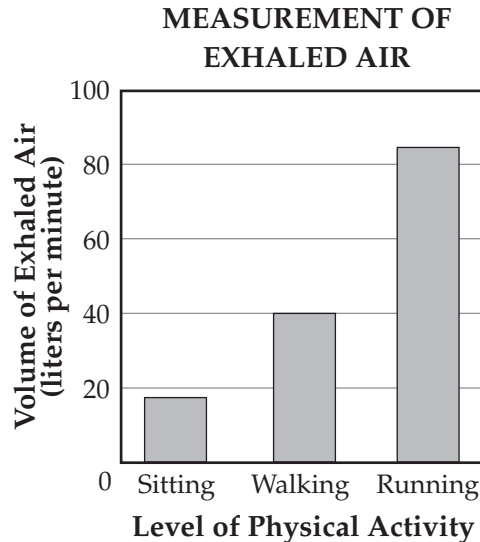
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Directions

Use the information and the graph below to answer Numbers 13 through 15.

A group of students measured the volume of air they exhaled during three different activities: sitting, walking, and running. The volume of exhaled air is directly related to the amount of carbon dioxide produced. The data the students collected are summarized in the graph below.



13 Which of these statements best explains the data?

- A As metabolism increases, the amount of carbon dioxide produced decreases.
- B As metabolism increases, the amount of carbon dioxide produced increases.
- C The rate of metabolism depends on the amount of carbon dioxide produced.
- D The amount of carbon dioxide production remains constant as metabolism increases.

14 Which of these processes produces carbon dioxide?

- F mitosis
- G diffusion
- H respiration
- J photosynthesis

15 According to the data, as physical activity increases, the amount of carbon dioxide produced

- A decreases
- B increases
- C remains constant
- D decreases, then increases





16
BCR

Some farmers in India grow a species of rice. In 1970 a virus destroyed most of these rice plants. Some of the rice plants survived the virus. These plants grew and produced a new generation of plants that were not affected by the virus.

- The population of rice plants changed as a result of the virus. Name and explain the process that caused this change in the population of rice plants.
- What were some differences between the plants that survived and the plants that died?
- Describe the most likely reason the surviving plants were able to grow and continue to reproduce.

Write your answer in your Answer Book.





17 What is one role of transfer RNA in the cell?

- A preparing the genes for messenger RNA
- B changing nitrogen bases into amino acids
- C preparing messenger RNA for the ribosomes
- D carrying amino acids to the ribosomes

18 A researcher is testing the effect of acid rain on living organisms. She takes a tissue sample and places it in acid rainwater, which decreases its pH. As the pH decreases, what will most likely happen to the enzyme reaction rates in the cells of this tissue?

- F They will increase.
- G They will decrease.
- H They will stay the same.
- J They will increase and level off.



Directions

Use the information below to answer Numbers 19 and 20.

A pair of laboratory mice are crossed to obtain offspring. Three alleles found in the female gamete are ABC. Three alleles found in the male gamete are Abc.

19 What is formed when a male gamete combines with a female gamete?

- A zygote
- B egg
- C sperm
- D chromosome

20 Which of these is a possible combination of alleles for the offspring produced by these mice?

- F AaBbCc
- G AABBCC
- H aabbcc
- J AABbCc



- 21** A group of students conducted an experiment to study the growth of bean plants. An equal number of bean plants of similar size were planted in containers A and B. Each day for five days, Container A received water only, while Container B received an equal amount of weak fertilizer solution. The table below shows the average height of the plants in each container for each day of the experiment.

PLANT GROWTH EXPERIMENT

Day	Average Height (in centimeters)	
	Container A: Water Only	Container B: Water plus Fertilizer
1	2.0	2.0
2	2.2	2.3
3	2.3	2.8
4	2.5	3.2
5	2.6	3.8

Which of these is being tested in this experiment?

- A effect of water on plant height
- B effect of fertilizer on plant height
- C maximum height the plants will grow
- D number of days the plants will grow



22 The nucleotide base sequence of a strand of DNA is TAC-CGG-AGT. What is the sequence of the complementary DNA strand?

- F TAC-CGG-AGT
- G ACT-GAA-CGA
- H AGT-TCC-TAC
- J ATG-GCC-TCA

23
BCR A scientist wants to determine the genotype of a black female rabbit. She knows that the allele for black fur (B) is dominant to the allele for brown fur (b) and is not sex-linked. The scientist performs a cross with a brown male rabbit to try to determine the genotype of the female rabbit.

Complete the following steps to determine if the black female rabbit is homozygous or heterozygous for fur color.

- Identify the two possible genotypes of the female rabbit.
- Complete two Punnett squares using the possible genotypes of the parent rabbits to show the expected offspring.
- Explain how the fur color of the offspring would help the scientist determine the genotype of the female rabbit.

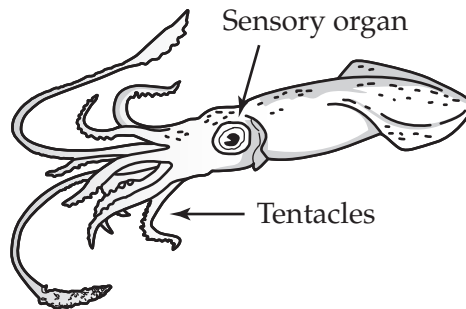
Write your answer in your Answer Book.



Directions

Use the information and the diagram below to answer Numbers 24 through 26.

Squid are marine animals that have a complete circulatory system and reproduce sexually. A diagram of a squid is shown below.



24 Which of these transports nutrients to the cells of a squid?

- F gametes
- G blood
- H sea water
- J nerves

25 Which of these is not a purpose of a squid's sensory organs?

- A finding mates
- B avoiding predators
- C excreting waste
- D locating prey

26 What organ system controls the movement of the squid's tentacles?

- F circulatory system
- G nervous system
- H respiratory system
- J excretory system



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Session **2**



- 27** Evidence suggests that bacteria supplied with a cup of sugar could run a 60-watt light bulb for 17 hours.

Which of these was most likely used to affirm this scientific idea?

- A formulate a hypothesis
- B identify the problem
- C conduct an experiment
- D write a conclusion

- 28** Scientists estimate that dental plaque contains up to 1×10^{11} bacteria per gram. Which number is equal to 1×10^{11} ?

- F 1,000,000,000
- G 10,000,000,000
- H 100,000,000,000
- J 1,000,000,000,000





29

Anna conducted an experiment using green algae. She put equal amounts of water into two identical containers and maintained the water level throughout the experiment. Next she added equal amounts of green algae to both containers. Container 1 received full sunlight while Container 2 was placed in the dark.

After two weeks, what will Anna most likely find in Containers 1 and 2?

- A no algae in either container
- B abundant algae in both containers
- C no algae in Container 1 and abundant algae in Container 2
- D abundant algae in Container 1 and no algae in Container 2

30

BCR

Nutrients taken in by the body are broken down during cell processes. Some products of these cell processes can be harmful if not removed from the body.

Describe how harmful waste products are removed from the body. In your response, be sure to

- identify the parts of a cell that are involved in waste removal
- identify the body systems involved in the removal of waste products
- explain how the body systems work together to remove waste from the body

Write your answer in your Answer Book.





Directions

Use the information and the chart below to answer Number 31.

A student designed the chart below to classify different organisms into four groups.

CLASSIFICATION CHART

I.	Wings	Go to II
	No wings	Group A
II.	Feathers	Group B
	No feathers	Go to III
III.	Two legs	Group C
	Six legs	Group D

31 According to the student's classification chart, an organism with no wings and four legs would belong to which group?

- A Group A
- B Group B
- C Group C
- D Group D



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Directions

Use the technical passage below to answer Numbers 32 and 33.

Black Bear Sightings are on the Rise

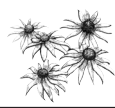
Black bears are the largest mammals native to Maryland. Adults typically weigh between 150 and 400 pounds. Their color can range from black to brown to cinnamon. They have a tan muzzle and may have some white on their chest. Black bears have a short, bobbed tail and small, rounded ears. They live mostly in thick forested areas in Maryland. Black bears are shy, solitary animals. They require a lot of space for their home range. Adult black bears can have a home range of about 15 to 25 square miles.

When the land was being settled, the black bear's habitat was cleared for farms and villages. Because settlers misunderstood bears and felt threatened by them, bears were killed in large numbers. As a result, black bears were soon found only in small numbers and only in the westernmost part of the state. In 1956 there were only about 12 black bears in the whole state. When the black bear population was studied in 2000, as many as 437 bears were estimated to live in Maryland.

Black bears eat a lot of different foods. They will eat whatever is easy to get. Their favorite natural foods include plants, berries, fruits, acorns, insects, roots, and grasses. They may also eat reptiles, amphibians, fish, and dead animals. If available, black bears will eat non-natural foods associated with humans, such as garbage, bird seed, pet food, and agricultural crops like corn. Black bears will only come near a home if there is something to attract them, such as food. Once a bear finds available food, it will likely return again and again.

Both black bears and humans feel threatened when confronted with one another. When threatened, bears often display unusual behaviors, such as hitting the ground with its paws, charging only to stop several feet from the threat, or standing upright on its hind legs. Since humans usually perceive these behaviors as being aggressive, black bears are once again being viewed as a problem.





32 What is the ecological role of the black bear?

- F producer
- G carnivore
- H omnivore
- J decomposer

33 Recent increases in bear-human interactions in the westernmost part of Maryland are causing serious problems. Which of these is the most likely cause for this increased interaction?

- A increase in non-natural food sources
- B decrease in the black bear population
- C larger forested areas
- D changes in climate

34 Some bacteria live in habitats without light. They produce their own food using inorganic substances from the environment.

Which of these terms best describes this process?

- F photosynthesis
- G cellular respiration
- H binary fission
- J chemosynthesis





Directions

Use the information below to answer Numbers 35 and 36.

Hummingbirds need large amounts of energy to flap their wings between 60 and 200 times per second. Their wings beat so rapidly that it is difficult to see them move. They often appear suspended in air for extended periods of time without changing their location. Hummingbirds have long bills and grooved tongues to reach into flowers to feed on flower nectar. They also feed on insects.

35 The body system most directly interacting with the skeletal system to enable hummingbirds to beat their wings between 60 and 200 times per second is the

- A digestive system
- B muscular system
- C endocrine system
- D circulatory system

36 Which term best describes the ecological relationship between hummingbirds and insects?

- F mutualism
- G parasite–host
- H predator–prey
- J commensalism

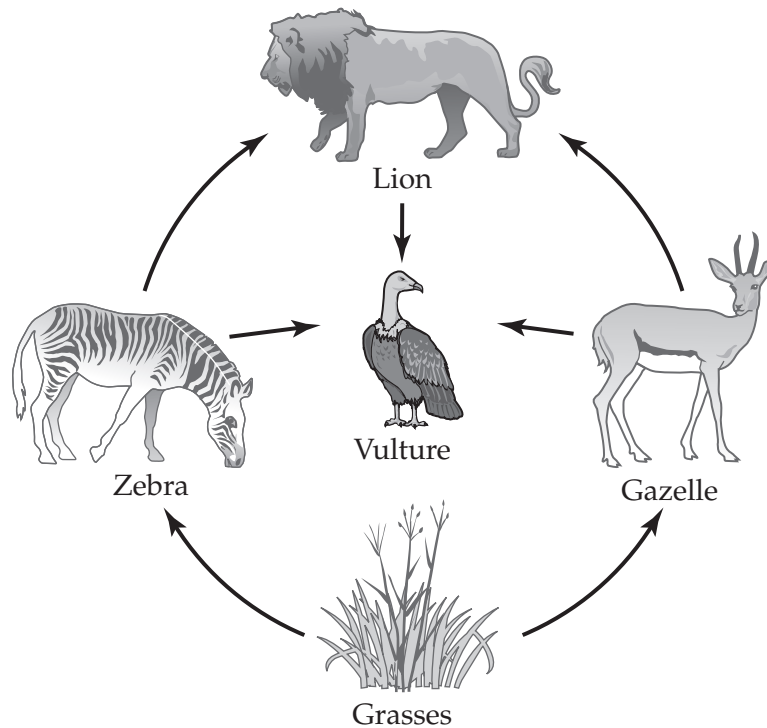




37
BCR

Students are building an exhibit of an East African food web for a science fair. The food web they are using is shown below.

EAST AFRICAN FOOD WEB



Analyze the roles of the organisms and the flow of energy in the East African food web. In your response, be sure to

- identify the role of each organism in the food web
- describe the relationship among the organisms in the ecosystem
- explain how a pyramid can be used to show the relationship among the organisms in the food web
- explain how the organisms in this food web would best fit in a pyramid model

Write your answer in your Answer Book.





38 Many bacteria live in fresh water. Which of these statements best describes what will happen when freshwater bacterial cells are placed in salt water?

- F Water leaves the cell, causing the cell to expand.
- G Water leaves the cell, causing the cell to shrink.
- H Water enters the cell, causing the cell to expand.
- J Water enters the cell, causing the cell to shrink.

39 Most bacteria do not have the ability to break down oil that is accidentally spilled into the ocean by tankers. However, scientists can insert a gene into the DNA of a bacterium to give it the ability to break down the oil. This technology is an example of

- A crossing-over
- B DNA replication
- C gene splicing
- D translation

40 A researcher is studying raccoons and skunks. She wants to find out how closely these two mammals are related. Which of these characteristics would be best for her to study?

- F sequences of DNA
- G reproductive habits
- H movement of RNA
- J physical appearance





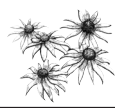
41 Apomixis is a type of asexual reproduction in which adult plants grow directly from egg cells. Which of these does not occur during apomixis?

- A mitosis
- B translation
- C fertilization
- D transcription

42 Doctors lower a patient's body temperature during some surgical procedures. Which of these is the most likely benefit of lowering body temperature for surgery?

- F a decrease in blood circulation
- G an increase in metabolism
- H an increase in blood circulation
- J a decrease in pH



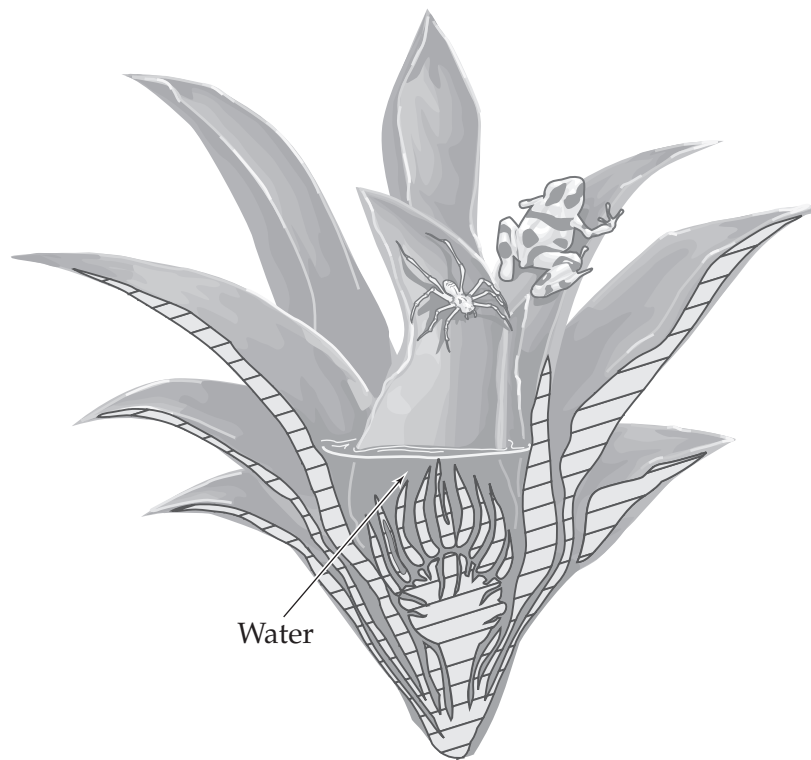


Directions

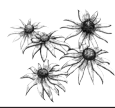
Use the information and the figure below to answer Numbers 43 through 45.

Many plants that grow in tropical rain forests have specialized roots that anchor them to the branches and trunks of trees. They do not harm the trees. These plants get food and water from various sources, including the air and dead organic matter found on the trees.

One example of these plants found in tropical rain forests is the bromeliad. Its leaves form a cup-like structure that is able to hold water. This water provides a feeding and breeding area for many insects and frogs. Snakes and lizards also come to these plants in search of food and water. A cross-section showing the inside of a bromeliad is shown below.



Bromeliad Cross-Section



- 43** Snakes and lizards come to the bromeliads to feed on frogs and their eggs. The relationship between the snakes, lizards, and frogs can best be described as
- A mutualism
 - B parasite–host
 - C predator–prey
 - D commensalism
- 44** Which of these types of organisms break down dead organic matter in the rain forest?
- F producers
 - G predators
 - H herbivores
 - J decomposers
- 45** Which of these terms best describes the wide variety of plant and animal species in the rain forest?
- A niche
 - B diversity
 - C commensalism
 - D mutualism



**46**
BCR

Before the three-dimensional structure of DNA was discovered, scientists knew that DNA contained nitrogen bases. The chart below shows the percentages of nitrogen bases in a DNA sample.

PERCENT OF NITROGEN BASES

Base	Percent
A	24
T	24
C	26
G	26

Explain how the relative amounts of nitrogen bases in a DNA molecule is closely linked to DNA replication. In your response, be sure to

- describe the composition of a DNA molecule
- describe the structure of a DNA molecule
- describe the process by which DNA replicates
- explain how the arrangement of nitrogen bases ensures the relatively error-free replication of DNA molecules

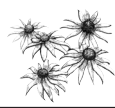
Write your answer in your Answer Book.

47

A 125-million-year-old small mammal skeleton was recently discovered in China. The role of this small mammal in its ecosystem can best be determined by comparing its skeleton to

- A ancient small mammal skeletons
- B modern small mammal skeletons
- C modern small mammal DNA
- D ancient small mammal DNA





- 48** A protozoan lives inside a rat and takes its nourishment from the rat's body. Because the protozoan damages the rat's brain, the rat loses its fear of cats. A cat attacks an infected rat; the protozoan enters the cat's body and completes its life cycle.

Which of these describes the relationship between the protozoan and the rat?

- F commensalism
- G parasite–host
- H mutualism
- J predator–prey

- 49** One parent is homozygous dominant for brown hair (BB). The other parent is heterozygous for brown hair (Bb).

What is the probability that the offspring will have brown hair?

- A 100%
- B 75%
- C 50%
- D 25%





50 Some adult insects are unable to swim but are able to walk on top of water. What characteristic of water enables these insects to walk on top of water?

- F pH
- G surface tension
- H solvent properties
- J atomic bonds

51 Which of these make up the primary link between a gene and the expression of a trait?

- A proteins
- B sugars
- C lipids
- D vitamins





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